

Claims

1. Permanently oriented pressure-sensitive adhesive comprising an acrylate-based UV-crosslinked polymer which 1.) is synthesized in a mass fraction of at least 50% from at least one acrylic monomer according to the general formula (I)



in which R_1 is hydrogen (H) or a methyl group (CH_3) and R_2 is hydrogen (H) or a branched or unbranched, saturated C_1 to C_{30} hydrocarbon radical, which may optionally be substituted by a functional group, and 2.) is composed in a mass fraction of from 0.05% to 1% of a UV-crosslinked photoinitiator, the pressure-sensitive adhesive, in the form of a film applied as a melt (hotmelt), having a preferential direction which is characterized in the free film by a shrinkback of at least 3% relative to an original stretching of the film in the preferential direction.

2. Pressure-sensitive adhesive according to Claim 1, **characterized by** a refractive index measured in a preferential direction, n_{MD} , which is greater than a refractive index measured in a direction perpendicular to the preferential direction, n_{CD} , the difference $\Delta n = n_{MD} - n_{CD}$ being at least $1 \cdot 10^{-6}$.
3. Pressure-sensitive adhesive according to Claim 1 or 2, **characterized by** an average molecular weight of the acrylate polymer of at least 200 000 g/mol.
4. Pressure-sensitive adhesive according to any one of the preceding claims, **characterized in that** the radical R_2 of the at least one acrylic monomer according to the general formula (I) is chosen from the group of unbranched or branched, saturated C_4 to C_{14} hydrocarbon radicals, in particular C_4 to C_9 hydrocarbon radicals.
5. Pressure-sensitive adhesive according to any one of the preceding claims, **characterized in that** the at least one acrylic monomer according to the general formula (I) is selected from the group consisting of methyl acrylate, methyl

methacrylate, ethyl acrylate, n-propyl acrylate, n-butyl acrylate, n-butyl methacrylate, n-pentyl acrylate, n-hexyl acrylate, n-heptyl acrylate, n-octyl acrylate, n-octyl methacrylate, n-nonyl acrylate, lauryl acrylate, stearyl acrylate and behenyl acrylate and also branched isomers of these, especially isobutyl acrylate, 2-ethylhexyl acrylate, 2-ethylhexyl methacrylate, isooctyl acrylate and isooctyl methacrylate.

6. Pressure-sensitive adhesive according to any one of the preceding claims, **characterized in that** R_2 is a bridged or unbridged, substituted or unsubstituted cycloalkyl group and in that in particular the at least one acrylic monomer of formula (I) is selected from the group consisting of cyclohexyl methacrylate, isobornyl acrylate, isobornyl methacrylate and 3,5-dimethyladamantyl acrylate.

7. Pressure-sensitive adhesive according to any one of the preceding claims, **characterized in that** the acrylate polymer is synthesized from at least one further acrylic or vinylic comonomer.

8. Pressure-sensitive adhesive according to any one of the preceding claims, **characterized in that** the at least one monomer of the formula (I) and/or the at least one comonomer carries a functional and/or group selected from the group consisting of carboxyl, sulphonic acid, phosphonic acid, hydroxyl, lactam, lactone, N-substituted amide, N-substituted amine, carbamate, epoxy, thiol, alkoxy, cyano, ether or halide group.

9. Pressure-sensitive adhesive according to any one of the preceding claims, **characterized in that** the at least one comonomer is selected from the group of the N-alkyl-substituted amides, in particular from the group consisting of N,N-dimethylacrylamide, N,N-dimethylmethacrylamide, N-tert-butylacrylamide, N-vinylpyrrolidone, N-vinyl lactam, dimethylaminoethyl acrylate, dimethylaminoethyl methacrylate, diethylaminoethyl acrylate, diethylaminoethyl methacrylate, N-methylolacrylamide, N-methylolmethacrylamide, N-(butoxymethyl)methacrylamide, N-(ethoxymethyl)acrylamide and N-isopropylacrylamide.

10. Pressure-sensitive adhesive according to any one of the preceding claims,
characterized in that the at least one comonomer is selected from the group
consisting of hydroxyethyl acrylate, hydroxyethyl methacrylate, hydroxypropyl
acrylate, hydroxypropyl methacrylate, allyl alcohol, maleic anhydride, itaconic
5 anhydride, itaconic acid, glycidyl methacrylate, phenoxyethyl acrylate,
phenoxyethyl methacrylate, 2-butoxyethyl acrylate, 2-butoxyethyl methacrylate,
cyanoethyl acrylate, cyanoethyl methacrylate, glyceryl methacrylate,
6-hydroxyhexyl methacrylate, vinylacetic acid, tetrahydrofurfuryl acrylate,
 β -acryloyloxypropionic acid, trichloroacrylic acid, fumaric acid, crotonic acid,
10 aconitic acid, and dimethylacrylic acid.
11. Pressure-sensitive adhesive according to any one of the preceding claims,
characterized in that the at least one comonomer is selected from the group
consisting of vinyl esters, vinyl ethers, vinyl halides, vinylidene halides, vinyl
15 compounds containing aromatic rings and vinyl compounds containing
heterocycles in α position from the group consisting of vinyl acetate,
vinylformamide, vinylpyridine, ethyl vinyl ether, vinyl chloride, vinylidene chloride
and acrylonitrile.
- 20 12. Pressure-sensitive adhesive according to any one of the preceding claims,
characterized in that the at least one comonomer is selected from the group
consisting of aromatic vinyl compounds, in particular having aromatic C_1 to C_{18}
nuclei with or without heteroatoms, especially styrene and styrene derivatives,
4-vinylpyridine, N-vinylphthalimide, methylstyrene, 3,4-dimethoxystyrene,
25 4-vinylbenzoic acid, benzyl acrylate, benzyl methacrylate, phenyl acrylate, phenyl
methacrylate, t-butylphenyl acrylate, t-butylphenyl methacrylate, 4-biphenyl
acrylate, 4-biphenyl methacrylate, 2-naphthyl acrylate and 2-naphthyl
methacrylate.
- 30 13. Pressure-sensitive adhesive according to any one of the preceding claims,
characterized in that the acrylate polymer is further synthesized from at least one
crosslinker which is selected in particular from the group consisting of difunctional
or polyfunctional acrylates and/or methacrylates, difunctional or polyfunctional
isocyanates and difunctional or polyfunctional epoxides.

14. Pressure-sensitive adhesive according to any one of the preceding claims, **characterized in that** resins and/or other additives are added to the pressure-sensitive adhesive, especially ageing inhibitors, light stabilizers, ozone protectants, fatty acids, plasticizers, nucleators, blowing agents, accelerators and/or fillers.

15. Process for preparing an oriented pressure-sensitive adhesive according to any one of Claims 1 to 14, comprising the steps of
(a) polymerizing at least one acrylic monomer according to the general formula (I),



in which R₁ is hydrogen (H) or a methyl group (CH₃) and R₂ is hydrogen (H) or a branched or unbranched, saturated C₁ to C₃₀ hydrocarbon radical which is optionally substituted by a functional group,
(b) coating the acrylic polymer from the melt to form a film, in the course of which an orientation comes about in the pressure-sensitive adhesive, and
(c) crosslinking the film by means of UV radiation.

16. Process according to Claim 15, **characterized in that** coating takes place via a roll, through a melt die or through an extrusion die.

17. Process according to Claim 15 or 16, **characterized in that** after the coating operation the film is subjected to a drawing operation.

18. Process according to any one of Claims 15 to 17, **characterized in that** prior to the coating operation solvent residues from the polymerization are removed at least partly, in particular in a concentrating extruder.

19. Process according to any one of Claims 15 to 18, **characterized in that** the relaxation time which elapses between coating and crosslinking is as small as possible.

20. Process according to Claim 19, **characterized in that** the relaxation time amounts to not more than 60 minutes, in particular not more than 3 minutes, preferably not more than 5 seconds.
- 5 21. Process according to any one of Claims 15 to 20, **characterized in that** a degree of orientation of the pressure-sensitive adhesive is controlled by the UV dose, by the coating temperature, the molecular weight of the polymer, the draw ratio and/or the relaxation time between coating and crosslinking.
- 10 22. Process according to any one of Claims 15 to 21, **characterized in that** cooling is carried out during coating.
- 15 23. Process according to any one of Claims 15 to 22, **characterized in that** the polymerization is carried out in the presence of a crosslinker which is selected in particular from the group consisting of difunctional or polyfunctional acrylates and/or methacrylates, difunctional or polyfunctional isocyanates and difunctional or polyfunctional epoxides.
- 20 24. Process according to any one of Claims 15 to 23, **characterized in that** for crosslinking the pressure-sensitive adhesive comprises a UV initiator.
- 25 25. Use of a pressure-sensitive adhesive according to any one of Claims 1 to 14 as a one-side or both-sides adhesive layer for a single-sided or double-sided pressure-sensitive adhesive tape.